

ASSIGNMENT 1

Textbook Assignment: "Properties and Uses of Metals" and "Basic Heat Treatment,"
pages 1-1 through 2-11.

Learning Objective: Identify the mechanical and chemical properties of various metals used in the field by Steelworkers.

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| <p>1-1. Steelworkers work primarily with iron and steel.</p> <ol style="list-style-type: none">1. True2. False <p>1-2. Which of the following symbols is NOT a chemical symbol for a metal?</p> <ol style="list-style-type: none">1. Al2. Fe3. Cr4. Br <p>1-3. An alloy is defined as a substance having metallic properties that is composed of two or more elements.</p> <ol style="list-style-type: none">1. True2. False <p>1-4. The characteristics of elements and alloys are terms of physical, chemical, electrical, and mechanical properties.</p> <ol style="list-style-type: none">1. True2. False <p>1-5. Which of the following properties is an electrical property of an alloy?</p> <ol style="list-style-type: none">1. Load carrying2. Heat conductivity3. Magnetic qualities4. Wear resistance <p>1-6. Tension stresses are also known as "tensile stresses."</p> <ol style="list-style-type: none">1. True2. False <p>1-7. Having the capacity to conduct heat and electricity, to be lustrous, and to be deformed or permanently shaped at room temperature are properties of which of the following substances?</p> <ol style="list-style-type: none">1. Metalloid2. Nonmetal3. Metal4. Chemical | <p>1-8. Which of the following elements sometimes behave like-metals and at other times like nonmetals?</p> <ol style="list-style-type: none">1. Carbon and sulfur2. Titanium and iron3. Silver and tin4. Calcium and chloride <p>1-9. A metal alloy is a</p> <ol style="list-style-type: none">1. combination of halogens2. pure metal compound3. substance having metallic properties that is composed of two or more elements4. compound of metalloids <p>1-10. FeCrMn is the symbology for a metallic alloy composed of what elements?</p> <ol style="list-style-type: none">1. Iron, carbon, and magnesium2. Iron, chromium, and manganese3. Iron, chlorine, and molybdenum4. Iron, copper, and manganese <p>1-11. The color, density, weight, and heat conductivity of an element or alloy are known as what kind of properties?</p> <ol style="list-style-type: none">1. Chemical2. Electrical3. Mechanical4. Physical <p>1-12. Which of the following properties is NOT a mechanical property of a metal alloy?</p> <ol style="list-style-type: none">1. Sturdiness2. Elasticity3. Weight4. Hardness <p>1-13. Within a column that is supporting a roof beam, internal stresses develop. This condition is referred to by what term?</p> <ol style="list-style-type: none">1. Compression2. Shearing3. Tension4. Torsion <p>1-14. Tensile stresses are developed when a material is subjected to what type of force?</p> <ol style="list-style-type: none">1. Compression load2. Twisting action3. Shearing action4. Pulling load |
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1-15. Carbon steel has an ultimate tension and compression strength of what maximum psi?

1. 42,000
2. 48,000
3. 56,000
4. 66,000

1-16. What term is used to describe the tendency of a metal to fail after repeated stressing at the same point?

1. Tension
2. Ductility
3. Malleability
4. Fatigue

1-17. What term is used to describe the mechanical property of a metal that allows it to be drawn out into a thin wire?

1. Malleability
2. Toughness
3. Brittleness
4. Ductility

Learning Objective: Distinguish ferrous and nonferrous alloying elements and their use in metals.

1-18. What characteristic makes pig iron have limited use?

1. It is comparatively weak and brittle
2. It is difficult to remelt
3. It cannot be combined with other metals
4. It is used exclusively for manufacturing cast-iron pipe

1-19. When cast iron is alloyed with nickel, chromium, molybdenum, silicon, or vanadium, which of the following characteristics is enhanced?

1. Hardness
2. Tensile strength
3. Toughness
4. All of the above

1-20. What process is used to produce malleability in cast iron?

1. Remelting
2. Annealing
3. Plating
4. Alloying

1-21. What group of steel is best suited for the manufacture of crane hooks and axles?

1. High carbon
2. Medium carbon
3. Mild carbon
4. Low carbon

1-22. Steel containing 12% to 27% chromium, .08% to .20% carbon, and no nickel is in what group and series of stainless steel?

1. Martensitic-chromium of the 300 series
2. Austenitic chromium-nickel of the 300 series
3. Ferritic-austenite of the 400 series
4. Ferritic-chromium of the 400 series

1-23. For what purpose is nickel added to low-alloy nickel steel?

1. To increase strength and toughness
2. To reduce the chromium requirement due to weight limitations
3. To increase its ability to cut other metals after the steel becomes red-hot
4. To permit the steel to be drawn into wire

1-24. Which of the following metals is nonferrous?

1. Cast iron
2. Carbon steel
3. Aluminum
4. Pig iron

1-25. What element or base metal is alloyed with copper to produce bronze and is alloyed with lead to produce soft solders?

1. Zinc
2. Nickel
3. Tin
4. Aluminum

1-26. When used in conjunction with a numbering system that classifies different aluminum alloys, the letter "T" signifies that what action has occurred?

1. The metal has been heat-treated
2. The alloying elements have been tempered
3. The major alloying element has been tested
4. The metal has been covered with a tungsten rolled cover

- 1-27. What alloy contains 64% to 68% nickel, about 30% copper, and small percentages of iron, manganese, and cobalt ?
1. K-monel
 2. Inconel
 3. Monel
 4. Duralumin

Learning Objective: Identify the characteristics exhibited by different metals during spark and chip tests.

- 1-28. When applying the spark test to a metal, you notice the spark stream has shafts and forks only. What does this condition indicate about the metal under test?
1. It is steel having a high-carbon content
 2. It is steel having a low-carbon content
 3. It is a nickel alloy
 4. It is a molybdenum alloy
- 1-29. What metal produces a spark stream about 25 inches long with small and repeating sparklers of small volume that are initially red in color?
1. Nickel
 2. Stainless steel
 3. Grey cast iron
 4. Monel metal
- 1-30. Which of the following metals produces the shortest length spark stream?
1. High-carbon steel
 2. Low-carbon steel
 3. White cast iron
 4. Nickel
- 1-31. On which of the following metals does a chip test produce chips that have smooth surfaces and sawtooth edges?
1. Low-carbon steel
 2. Cast steel
 3. Aluminum
 4. Monel

Learning Objective: Identify the factors included in the theory of heat treatment.

- 1-32. Tempering, normalizing, hardening, and annealing are common forms of what process?
1. Cold forming of metals
 2. Heat treatment of nonferrous metals
 3. Heat treatment of ferrous metal
 4. Quenching of austenitic materials
- 1-33. Most nonferrous metals can be normalized and case hardened but not annealed.
1. True
 2. False
- 1-34. Which of the following conditions is required for the successful heat treatment of metals?
1. Proper size of furnace
 2. Proper furnace atmosphere
 3. Suitable quenching medium
 4. All of the above
- 1-35. An atmosphere that consists of gas-air combustion products is formed in what types of furnaces?
1. Oil-fired furnaces only
 2. Gas-fired and electric furnaces
 3. Both oil fired and gas fired
 4. Both oil fired and electric
- 1-36. Which of the following gas mixtures are constituents of a fuel-fired furnace atmosphere?
1. Hydrogen, oxygen, and nitrogen
 2. Nitrogen, argon, and radon
 3. Bromine, oxygen, and chlorine
 4. Hydrogen, argon, and radon
- 1-37. Oxidizing, reducing, and neutral atmospheres are provided in a fuel-fired furnace by which of the following processes?
1. Varying the type of fuel
 2. Construction of the furnace
 3. Varying the proportion of air to fuel
 4. Each of the above

- 1-38. In an electric furnace the atmosphere is either air or a controlled mixture of gases.
1. True
 2. False
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- Learning Objective: Recognize how each phase of heat treatment is produced and controlled and its effect on the metals being treated.
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- 1-39. What is the primary cause of distortion and cracking of the heat-treated part?
1. Heating the part too slowly
 2. Increasing the soaking temperature too slowly
 3. Heating one section of the part more rapidly than the rest of it
 4. Uneven expansion due to carbon deposits in the part
- 1-40. When parts are uneven in cross section, the soaking period is determined in what manner?
1. By the total weight
 2. By the largest section
 3. By the lightest section
 4. By the number of parts
- 1-41. What type of medium is normally used to quench nonferrous metals?
1. Oil
 2. Brine
 3. Air
 4. Water
- 1-42. Steel must be cooled very slowly in a medium that does NOT conduct heat easily in order to produce what kind of effect?
1. Maximum softness
 2. Maximum hardness
 3. Maximum ductility
 4. Minimum ductility
- 1-43. Copper becomes hard and brittle when mechanically worked; but it can be made soft again by annealing. To anneal it, you heat it at temperatures that fall within what range?
1. 500°F to 600°F
 2. 600°F to 700°F
 3. 700°F to 900°F
 4. 900°F to 1100°F
- 1-44. Normalizing is a form of heat treatment applicable to nonferrous metals only.
1. True
 2. False
- 1-45. Which of the following metals are difficult to harden by heat treatment?
1. Wrought iron
 2. Pure iron
 3. Extremely low-carbon steels
 4. All of the above
- 1-46. In plain carbon steel, the maximum hardness that can be obtained depends almost completely upon what factor?
1. The carbon content of the steel
 2. The thickness of the steel
 3. The heating time
 4. The temperature to which it was heated
- 1-47. What case-hardening method produces the hardest surface of any of the hardening processes?
1. Carburizing
 2. Halogenizing
 3. Cyaniding
 4. Nitriding
- 1-48. The steel parts are laced in a container packed with charcoal and heated in a furnace. Which of the following case-hardening processes is being used?
1. Cementation
 2. Pack hardening
 3. Carburizing
 4. Atmospheric cementation
- 1-49. A slightly oxidizing flame should be used on what areas of a part being flame hardened?
1. Flat surfaces
 2. Corners and grooves
 3. Rounded surfaces
 4. Edges and elongated sections
- 1-50. When flame hardening a steel part, you move the welding torch at a certain rate according to which of the following factors?
1. Mass of the part
 2. Shape of the part
 3. Depth of the hardness desired
 4. All of the above

- 1-51. Flame hardening produces a hard case that resists wear and a tough core that is unaffected by heat treatment.
1. True
 2. False
- 1-52. The process of heating steel to a specific temperature (below its hardening temperature), holding this temperature for a certain length of time, and then cooling the steel in still air to room temperature is known by what term?
1. Annealing
 2. Hardening
 3. Tempering
 4. Case hardening
- 1-53. Steel can be tempered provided some hardness remains after it has been normalized.
1. True
 2. False
- 1-54. The softness, ductility, and resistance to impact are NOT increased in which of the following metals?
1. Aluminum
 2. High-speed steel
 3. Low-carbon steel
 4. Already hardened steel
- 1-55. What are the most important properties to be obtained in tempering permanent steel magnets?
1. Stability and malleability
 2. Softness and malleability
 3. Hardness and stability
 4. Ductility and resistance to wear
- 1-56. When cooling a part in a quenching medium, you should agitate the part or the quenching medium for what reason?
1. To break up gases that form
 2. To induce oxidation
 3. To reduce the cooling rate
 4. To raise the temperature of the liquid
- 1-57. The flush method of quenching is better than other quenching methods for parts having cavities or recesses for which of the following reasons?
1. It enables formation of gases that enhance the hardening process
 2. It enduces oxygen into the process to increase the temperature
 3. It ensures a thorough uniform quench as liquid is sprayed all over the parts
 4. It facilitates the formation of gases that help reduce the temperature
- 1-58. When water is used as a quenching medium, it should NOT exceed what temperature?
1. 65°F
 2. 75°F
 3. 85°F
 4. 95°F
- 1-59. Of the following quenching mediums, which one has the highest cooling rate compared to water?
1. Fuel oil
 2. Caustic soda
 3. Brine, 10% solution at 65°F
 4. Sodium hydroxide, 10% solution
- 1-60. Which of the following is the solution?
1. 3.8% salt for every 3 gallons of water at 65°F
 2. 3/4 pound of salt per gallon of water at 65°F to 100°F
 3. 20% salt solution for the entire mix
 4. 3/4 pound of salt per 100 gallons of water
- 1-61. Caustic soda requires special handling because of its harmful effects on skin and clothing.
1. True
 2. False